PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION

Improvements in or relating to Variable Speed-Gears

I, FREDERICK WHIGHAM MCCONNEL, a British Subject, of Old Thorns Farm, Weavers Down, Liphook, Hampshire, do hereby declare the nature of this invention to be as follows:—

This invention relates to variable speed-gears of the infinitely variable type, and has for an object to provide a construction which is simple and inexpensive to manufacture. According to this invention, a variable speed-gear comprises two relatively rotatable transmission members, each having a circumferential friction track, a friction roller engaging both said tracks, a mounting for said roller having means for tilting the axis thereof in relation to the axes of the transmission members, which circumferential friction tracks and the periphery of the roller are so shaped that the tilting of the roller axis causes the ratio of the radial distances of the points of contact between the roller and the two transmission members to vary. In such an arrangement, the transmission members may be fixed against rotation and the roller may be arranged to be rotated bodily about the axis of the transmission member, thereby providing an epicyclic gear.

The aforesaid roller may be provided with a spherical or part-spherical periphery, and the frictional surfaces on the transmission members may be arranged tangential thereto, while the means for tilting the axis of the roller are such that the axis of tilt passes through the centre of the sphere.

Although the above arrangement enables the axis of the two transmission members to be inclined in relation to one another, they are preferably coaxial.

The peripheral surface of the roller may be other than spherical, or the axis of tilt may be disposed from the centre of the spherical surface, in which cases the two transmission members may be so arranged that they are resiliently pressed together, enabling the friction surface to be maintained in contact with the roller when the axis of tilt is altered.

In one form of construction the aforesaid transmission members may each comprise an inwardly-directed circumferential friction face. For example, each may comprise an annulus in which the inner periphery is arranged to provide the friction track. The friction surfaces thus provided may be conical in shape, and are arranged tangential to the surface of the roller.

In the case where an epicyclic arrangement is provided, the mounting for the roller may be pivotally connected by a link to a sleeve axially movable along the driving shaft but in driving connection therewith, so that axial movement of the sleeve is arranged to tilt the axis of rotation of the roller. In such an arrangement, pressure may be maintained between the roller and the two friction surfaces by reason of the centrifugal force imparted to the roller by its bodily rotation about the axis of the driving shaft. Spring means may, however, be provided for supplementing the aforesaid pressure.

The aforesaid roller may be mounted on an axle which is pivotally connected by said link to the sleeve, which axle is capable of longitudinal sliding movement in the roller.

The roller and its axle may be mounted in a cage rotatably supported on the driving shaft but fixed against axial movement thereon so as to prevent axial thrust being imparted from the roller to the two transmission members.

The aforesaid friction surfaces and the surface of the roller may be formed from hard steel.

Dated this 13th day of March, 1945.

BOULT, WADE & TENNANT,
111 & 112, Hatton Garden,
London, E.C.1,
Chartered Patent Agents.

[Price 1/-]

COMPLETE SPECIFICATION

Improvements in or relating to Variable Speed-Gears

I, FREDERICK WHIGHAM MCCONNEL, a British Subject, of Old Thorns Farm, Weavers Down, Liphook, Hampshire, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to an epicyclic variable speed-gear of the infinitely variable type, and has for an object to provide a construction which is simple and inexpensive to manufacture. According to this invention, an epicyclic variable speed-gear comprises two wheels each having an internal friction track, which two tracks engage different parts of a planet wheel formed as a friction roller which tracks and friction roller are so shaped as to permit the axis of the roller to be adjustably tilted causing the ratio of the radial distances from said axis to the point of contact between the roller and the two tracks to vary, a mounting for said roller adapted to impart tilting to said roller and to permit its bodily outward movement under centrifugal force whereby it is maintained against the friction track. In such an arrangement, one of the friction tracks may be arranged for connection with the driven shaft and the other is fixed, while the mounting is arranged to be rotated by a driving shaft.

The mounting together with roller is capable of bodily outward movement as well as being capable of tilting. The aforesaid roller may be provided with a spherical or part-spherical periphery, and the frictional surfaces on the wheels may be arranged tangential thereto, while the mounting for the roller is adapted to tilt about an axis which passes through the centre of the spherical surfaces.

The following is a description of one embodiment of the invention, reference being made to the accompanying drawing, in which:—

Figure 1 is a section through a part of the gear along a plane including the axes of the driving and driven shafts, and

Figure 2 is a side elevation of the mounting for the roller.

The driving and driven shafts 10 and 11 are mounted in bearings 12 and 13 in a casing 14 which may be fixed against rotation by a brake band engaging the surface 40. A block 15 is keyed or splined on the shaft 10 so as to slide axially thereon and is provided with one part 9 of a ball-race, the other part 8 of which is carried by a housing 7. The housing 7 is provided with pins 19 which are engaged by the bifurcated ends 18 of the limbs of a forked lever-arm 13. The forked lever-arm is pivotally mounted at 20 on said casing, and is provided with a lever-arm 21 which extends out through a slot in the casing, and is pivotally connected at its end to an adjusting rod 22. The adjusting rod is screw-threaded and receives an adjusting nut 23 having a stem portion 24 which embraces an internally threaded sleeve 25. The sleeve extends through a hole in a trunnion member 26 rotatable in lugs 27 fixed to the casing 14. The extremity of the sleeve is provided with a head 28 which abuts against a flat face formed on one side of the trunnion pin, while a shoulder 29 on the nut abuts a flat face on the opposite side of the pin. Thus, by rotating the nut the spindle 22 may be moved relatively to the casing and rock the lever-arm 21. By this means the block 15 may be adjusted along the shaft 10 The block carries on each side thereof pin 30 which engages slots in two pairs of fork arms 31 which straddle the block 15. One pair of arms constitutes a part of a mounting for a spherical roller 32 disposed on one side of the axes of the shafts 11 and 12, while the other pair of arms constitutes a part of a similar mounting carrying a roller on the opposite side of said axis, only one of which mountings is shown in Figure 1. The mounting carries a spindle 34 on which are mounted ball-bearings 33 located in housings in the roller 32. The fork arms 31 embrace flat side faces of the block 15 and thus the rotation of the shaft 10 is communicated to the roller mountings through the block 15. Thus, the rollers 32 and their forks 31 tend to be thrown outwardly by centrifugal force and thus movement is permitted by reason of the location of the pins 30 in the slots in the fork arms 31. Each roller engages two tracks 35 and 36 having conical faces arranged tangential to the surface of the roller, the former track 35 being fixed to the casing by bolts 37, while the latter track is fixed by bolts 38 to a spider member 39 fixed to the shaft 11. As indicated above the casing 14 is provided with a friction surface 40 which may be held by a brake-band. It will be appreciated that when the casing is held the bodily rotation transmitted to the roller mounting will cause the roller to be rotated on its spindle by reason of its contact with the fixed track 35. If the spindle

34 is inclined to the axes of the shafts 10 and 11, the point of contact between the track 35 and the roller will be at a different distance from the axis of the roller than the point of contact between the roller and the friction surface 36. Thus, the track 36 will rotate and transmit a drive to the shaft 11, the gear-ratio depending on the angle of tilt of the spindle 34. When the axis of the spindle is parallel with that of the shafts 10 and 11 no drive will be transmitted. Also, if the brake-band is released from the friction surface 40 no drive will be transmitted since the roller will merely roll around the track 36 and if the axis of the roller is inclined the roller will rotate the casing idly, and thus the device operates as a clutch.

Although the above arrangements have been described in relation to a driving and driven shaft arranged coaxially, it will be appreciated that they might be inclined relatively to one another.

Furthermore, the peripheral surface of the roller might be other than spherical and the mounting for the roller might be arranged so that the axis of tilting was disposed away from the axis of rotation of the roller, in both of which cases the two transmission members would be required to be mounted so as to be movable towards and away from one another, and so as to be resiliently pressed together, thus enabling the friction surfaces to be maintained in contact with the roller when the axis of tilt was altered.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. An epicyclic variable speed-gear comprising two wheels each having an internal friction track, which two tracks engage different parts of a planet wheel formed as a friction roller which tracks and friction roller are so shaped as to permit the axis of the roller to be adjustably tilted causing the ratio of the radial distances from said axis to the point of contact between the roller and the two tracks to vary, a mounting for said roller adapted to impart tilting to said roller and to permit its bodily outward movement under centrifugal force whereby it is maintained against the friction track.

2. An epicyclic variable speed-gear according to claim 1, wherein the mounting together with the roller is capable of bodily outward movement under centrifugal force as well as being capable of being tilted.

3. An epicyclic variable speed-gear according to claim 2, wherein the aforesaid roller is provided with a spherical or part-spherical periphery and the frictional surfaces of the wheels are arranged tangential thereto while the mounting for the roller is adapted to tilt about an axis which passes through the centre of the spherical surface.

4. A variable speed-gear substantially as described with reference to the accompanying drawings.

Dated this 3rd day of April, 1946.

BOULT, WADE & TENNANT,
111 & 112, Hatton Garden,
London, E.C.1,
Chartered Patent Agents.

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Fig. 1.

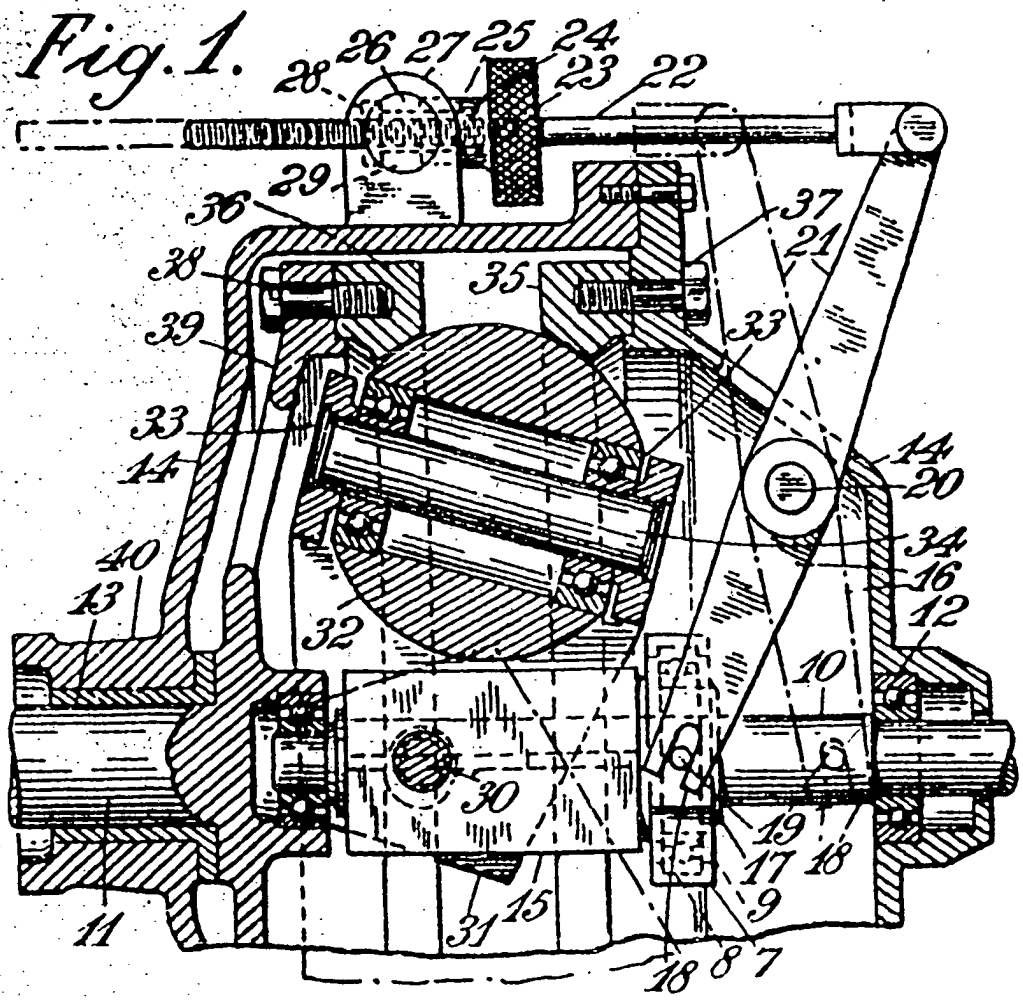

Fig. 2.